

Total No. of Printed Pages—16

5 SEM TDC CHM M 5 (N/O)

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(November)

CHEMISTRY

(Major)

Course : 505

(Organic Chemistry)

*The figures in the margin indicate full marks
for the questions*

(New Course)

Full Marks : 48

Pass Marks : 14

Time : 2 hours

1. Select the correct answer from the following :

1×5=5

(a) Pyrolysis of *trans*-3,4-dimethyl-1,5-hexadiene (a Cope rearrangement) gives

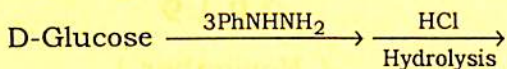
(i) 2*Z*, 6*E* octadiene

(ii) 2*Z*, 6*Z* octadiene

(iii) 2*E*, 6*E* octadiene

(iv) 2*E*, 6*Z* octadiene

(b) The product of the reaction



is

- (i) phenyl hydrazone of D-glucose
 - (ii) D-glucosazone
 - (iii) D-fructose
 - (iv) D-glucosone
- (c) In DNA, the complementary bases are
- (i) adenine and guanine; thymine and cytosine
 - (ii) uracil and adenine; cytosine and guanine
 - (iii) adenine and thymine; guanine and cytosine
 - (iv) adenine and thymine; guanine and uracil
- (d) Among the following the narcotic analgesic is
- (i) ibuprofen
 - (ii) heroin
 - (iii) aspirin
 - (iv) phenacetin

(3)

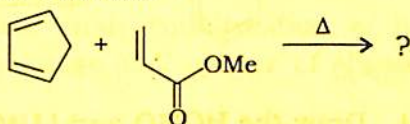
(e) Which enzyme is present in saliva?

- (i) Pepsin
- (ii) Trypsin
- (iii) Amylase
- (iv) Invertase

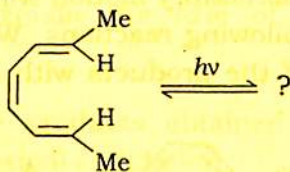
UNIT—I

Answer **any one** question

2. (a) (i) Explain the formation of major Endo product in the following Diels-Alder reaction : 1



- (ii) Predict the stereochemical outcome from the following electrocyclic reaction : 1

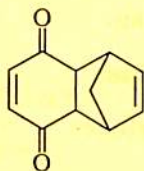


2E, 4Z, 6E octatriene

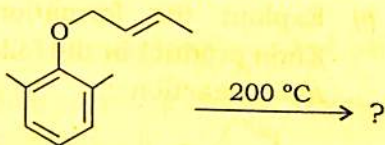
- (b) Explain with the help of FMO theory that the [1,3] sigmatropic shift of hydrogen is thermally forbidden. 2

(4)

- (c) What diene and dienophile would you employ to synthesize the following compound? 1

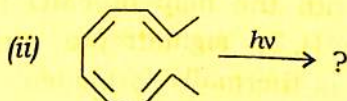
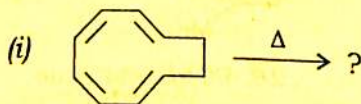


- (d) Complete the following reaction and discuss the mechanism involved : 2

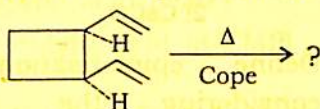


3. (a) Draw the HOMO and LUMO of ethylene and butadiene. 1+1=2

- (b) Predict whether conrotatory or disrotatory motion will take place in the following reactions. Write the structure of the products with stereochemistry : 1+1=2



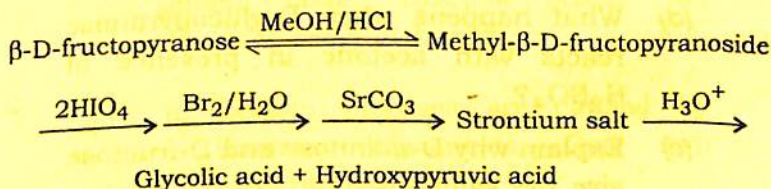
- (c) The Diels-Alder reaction proceeds stereoselectively Syn with respect to both the diene and the dienophile. Explain with suitable examples. 2
- (d) Complete the following reaction : 1



UNIT—II

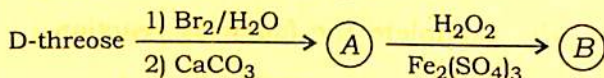
Answer **any one** question

4. (a) Draw the chair conformation of β -D-monopyranose (C-2 epimer of glucose). 1
- (b) When D-glucose is reduced with NaBH_4 , optically active glucitol results but when optically active D-galactose is reduced, the product is optically inactive. Explain the loss of optical activity. 2
- (c) Explain the products obtained in the following periodic oxidation : 3



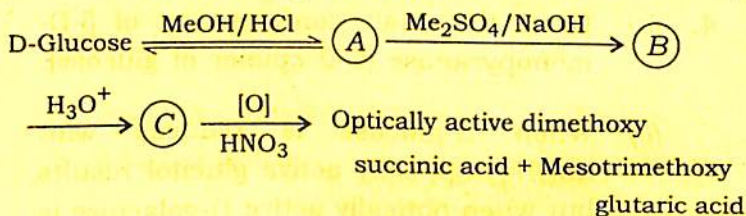
(d) Why do aldoses react with Fehling's solution and phenyl hydrazine but not with NaHSO_3 ? 2

(e) Complete the following reactions : 1



(f) Define epimerisation. Explain it considering the conversion of D-mannose to D-glucose. 2

5. (a) Predict whether D-glucose is a furanose or pyranose form, from the following oxidative degradation : 3



(b) Explain mutarotation taking D-glucose as an example. 2

(c) Convert D-ribose to its epimeric aldohexoses by using an ascending order reaction. 2

(d) What happens when D-glucopyranose reacts with acetone in presence of H_2SO_4 ? 2

(e) Explain why D-mannose and D-fructose give the same osazone. 2

UNIT—III

Answer *any one* question

6. (a) Draw the structures of the following : 1×2=2
- (i) Guanidylic acid (GMP)
 - (ii) deoxycytidylic acid (d-CMP)
- (b) Synthesize thymine from urea. 2
- (c) Discuss the Watson and Crick double-helix model of DNA. 3
- (d) Give evidences that in a adenosine or guanosine, the sugar unit is linked at position (N-9) of the purine. 2
7. (a) How would you synthesize uracil from malic acid and urea? 2
- Or
- Synthesize adenine from thiourea and malenitrile.
- (b) What do you understand by the term genetic code? Discuss briefly the chemical basis of heredity. 3
- (c) (i) Certain diseases are caused by enzyme deficiencies. Give two examples. 1

- (ii) Name the enzyme which is used to dissolve the blood clot. 1
- (d) Explain why hydrogen bonds between DNA strands are specific. Explain giving examples. 2

UNIT—IV

8. (a) Write in brief about the medicinal importance of azadirachtin present in neem. 2
- (b) Draw the structure of Ranitidine and give its medicinal importance. 1+1=2
- (c) Write down the synthesis of chloramphenicol starting from benzaldehyde. 2

Or

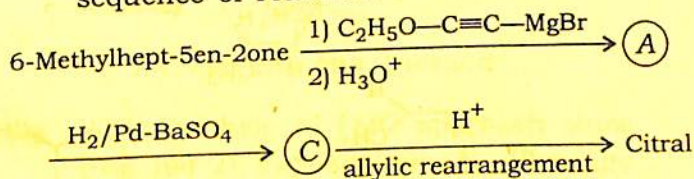
Synthesize chloroquine using the following sequential steps :

- (i) Synthesis of 4,7-dichloroquinoline from *m*-chloroaniline and oxalyl acetic ester
- (ii) Synthesis of chloroquine from the above quinoline derivative and 5-diethyl amino 2-amino pentane

- (d) Name the substance which can act as both analgesic and antipyretic. 1
- (e) How do the sulpha drugs prevent the growth and multiplication of bacteria when administered into a host body? 2

UNIT—V

9. (a) Synthesize citral by using the following sequence of reactions : 2



- (b) How will you show that citral has an $\alpha\beta$ -unsaturated aldehydic group? 1
- (c) Discuss the mechanism of hydration of geraniol or nerol to α -terpineol. 2

Or

Synthesize α -terpineol from *p*-toluic acid.

- (d) What happens when α -terpineol is subjected to oxidative degradation with alkaline KMnO_4 , CrO_3 subsequently? 2

(10)

(Old Course)

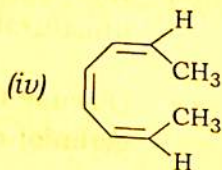
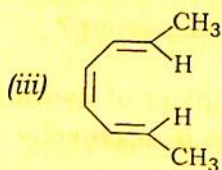
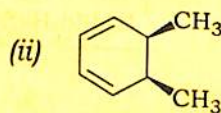
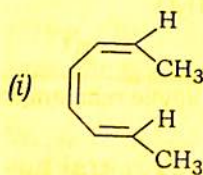
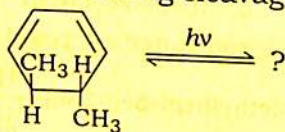
Full Marks : 48

Pass Marks : 19

Time : 3 hours

1. Select the correct answer/Answer the following : 1×5=5

(a) The product obtained during the following photochemical ring cleavage is



(b) Fructose reduces Tollens reagent due to

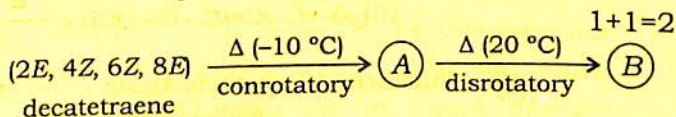
- (i) asymmetric carbons
- (ii) primary alcoholic group
- (iii) secondary alcoholic group
- (iv) enolization of fructose followed by conversion to aldehyde by base

- (c) Adenosine is an example of a
- purine base
 - nucleotide
 - nucleoside
 - pyridoxine base
- (d) Draw the structure of ibuprofen. Give one important use of it.
- (e) What are geranial and neral?

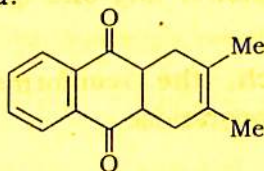
UNIT—I

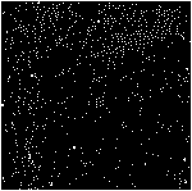
Answer *any one* question

2. (a) With the help of FMO approach show that [4+2] cycloaddition is thermally allowed but photochemically forbidden. 3
- (b) Predict the products and stereochemistry in the following reactions :

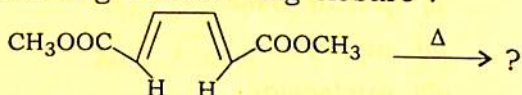


- (c) What diene and dienophile would you employ to synthesize the following compound? 1

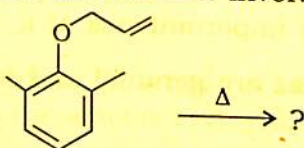




- (d) Draw the product formed in the following thermal ring closure : 1



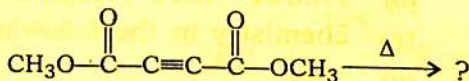
3. (a) Complete the following reaction and discuss the mechanism involved : 2



- (b) Draw the MO of 1,3-butadiene indicating HOMO in the ground and excited state. 2

- (c) Write the product with stereochemistry of the following reactions : $1\frac{1}{2} \times 2 = 3$

- (i) *trans-trans*-2,4hexadiene +



- (ii) Butadiene + Dimethylmaleate (cis-dienophile) $\xrightarrow{\Delta}$?

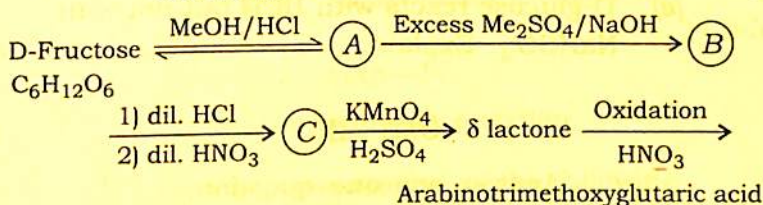
UNIT—II

Answer *any one* question

4. (a) Sketch the conformation of α -D-fructopyranose. 1

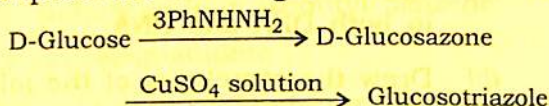
- (b) Predict whether D-fructose is a furanose or pyranose form from the following evidences :

4



- (c) Complete the following reaction :

2



- (d) What happens when methyl α -D-arabinopyranoside is treated with HIO_4 ?

2

- (e) Convert D-ribose to a pair of epimeric D-aldohexoses by using Fischer-Kiliani synthesis.

2

5. (a) Explain that both α -D-glucopyranose and α -D-allopyranose give the same strontium salt having same specific rotation by using periodic oxidation.

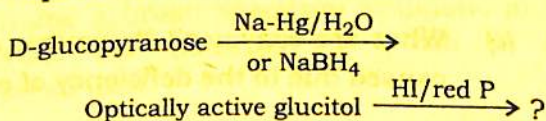
3

- (b) Convert D-fructose to epimeric aldohexoses.

2

- (c) Complete the following reaction :

2



- (d) Explain mutarotation taking D-glucose as an example. 2
- (e) D-glucose reacts with HCN but not with NaHSO₃. Explain. 2

UNIT—III

Answer *any one* question

6. (a) Synthesize an important purine present in both DNA and RNA. 2
- (b) Draw the structures of the following : 1×2=2
- (i) Nucleoside of Adenosine
- (ii) Nucleotide of AMP
- (c) What do you understand the term genetic code? Discuss briefly the chemical basis of heredity. 1+2=3
- (d) What are coenzymes? Discuss their functions. 1+1=2
7. (a) How would you synthesize uracil from urea and ethyl acrylate? 2
- (b) What are complementary bases? Draw the structure to show H-bonding between adenine and thymine. 1+1=2
- (c) What are enzymes? Name two diseases caused due to the deficiency of enzyme. 2

- (d) Name the products obtained on complete hydrolysis of DNA. In what way a nucleotide differs from a nucleoside? Illustrate with examples.

1+2=3

UNIT—IV

Answer any **one** question

8. (a) Give the preparation of the following :

2×2=4

(i) Ibuprofen from isobutyl benzene

(ii) Sulphaguanidine

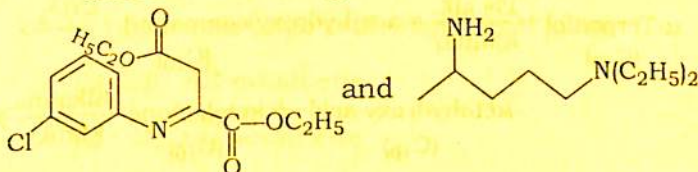
- (b) Write in brief about the medicinal importance of curcumin. 2

- (c) Write the structure of chloramphenicol. 1

- (d) Synthesize sulphanilamide from sulphanilic acid. 2

9. (a) Write down the method of preparation of one analgesic drug. 2

- (b) Using following diester and amino alkane, how would you synthesize an anti-malarial drug? 3



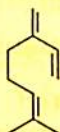
- (c) Name a broad spectrum antibiotic and state two diseases for which it is prescribed. 1+1=2

- (d) Prepare Aspirin by using a Green method. 2

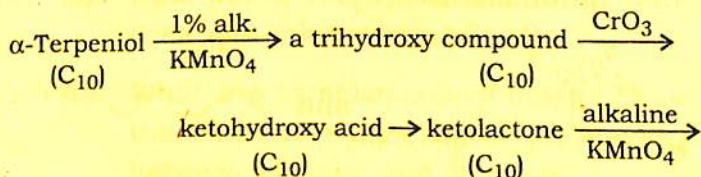
UNIT—V

Answer any one question

10. (a) Establish the structure of citral. 4
 (b) What products would you recover from the ozonolysis of the following terpenoids? 2



- (c) Giving one example, state isoprene rule. 1
 11. (a) Synthesize α -terpineol from *p*-toluic acid. 2
 (b) In citral one of the double bonds is at α,β -position w.r.t., aldehydic group. Explain. 2
 (c) Complete the following oxidative degradation of α -terpineol : 3

Terpenylic acid \rightarrow Terebic acid
